Claims

1. A preventive and/or therapeutic agent for a sleep disorder containing an ORL-1 receptor agonist.

2. A preventive and/or therapeutic agent for a sleep disorder comprising a therapeutically effective amount of an ORL-1 receptor agonist and pharmaceutically acceptable additives.

3. The preventive and/or therapeutic agent of claim 1 or 2, wherein the sleep disorder is a circadian rhythm sleep disorder.

4. The preventive and/or therapeutic agent of claim 3, wherein the circadian rhythm sleep disorder is a jet-lag syndrome.

5. The preventive and/or therapeutic agent of claim 3, wherein the circadian rhythm sleep disorder is shift-work sleep disorder.

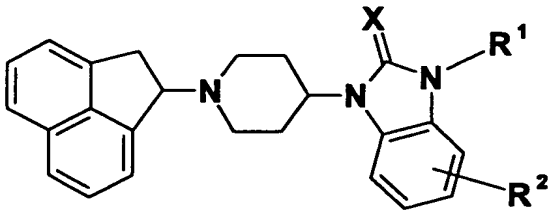
6. The preventive and/or therapeutic agent of claim 3, wherein the circadian rhythm sleep disorder is a delayed sleep phase syndrome.

7. The preventive and/or therapeutic agent of claim 1 or 2, used for preventing and/or treating the symptoms involved in a geriatric circadian rhythm sleep disorder.

8. The preventive and/or therapeutic agent of claim 1 or 2, used for bright light therapy.

9. The preventive and/or therapeutic agent of claim 1 or 2, wherein the ORL-1 receptor agonist has an affinity of 1000 nmol/L or less IC_{50} value for the ORL-1 receptor, and further inhibits cAMP elevation caused by a cAMP inducer by 50% or more at a concentration of 1000 nmol/L or less.

10. A compound represented by the formula (I)



(I)

wherein

R^1 is

(1) hydrogen,

(2) lower alkyl,

(3) lower alkenyl,

(4) -C(O)-lower alkyl,

(5) -C(O)O-lower alkyl,

(6) -C(O)-phenyl (the phenyl group may be substituted with lower alkyl, halogen, lower alkoxy, phenoxy or benzyloxy),

(7) lower alkyl-carboxyl,

(8) lower alkyl-C(O)-phenyl (the phenyl group may be substituted with lower alkyl, halogen, lower alkoxy, phenoxy or benzyloxy),

(9) lower alkyl-C(O)O-lower alkyl,

(10) lower alkenyl-C(O)O-lower alkyl,

(11) lower alkyl-O-lower alkyl,

(12) lower alkyl-$C(O)NR^3R^4$,

(13) -$S(O)_2$-lower alkyl,

(14) -$S(O)_2$-phenyl (the phenyl group may be substituted with lower alkyl, halogen, lower alkoxy, phenoxy or benzyloxy),

(15) lower alkyl-S-lower alkyl,

(16) lower alkyl-S(O)-lower alkyl,

(17) lower alkyl-$S(O)_2$-lower alkyl,

(18) lower alkyl-$S(O)_2NR^3R^4$,

(19) phenyl (the phenyl group may be substituted with lower alkyl, halogen, lower alkoxy, phenoxy or benzyloxy), or

(20) benzyl (the phenyl group may be substituted with lower alkyl, halogen, lower alkoxy, phenoxy or benzyloxy),

R^2 is hydrogen, lower alkyl, halogen, lower alkoxy, phenoxy, benzyloxy, trifluoromethyl, nitro, amino or cyano,

R^3 and R^4

may be the same or different, and each is hydrogen, lower alkyl or lower alkenyl, or R^3 and R^4 may bind with an adjacent nitrogen atom to form a saturated nitrogen-containing hetero ring (the hetero ring may be substituted with lower alkyl, halogen, lower alkoxy, phenoxy or benzyloxy), and

X is O or S.),

a racemic mixture thereof, an enantiomer corresponding thereto, or a pharmaceutically acceptable salt thereof.

11. The compound of claim 10, wherein R^2 is hydrogen, and X is O.

12. The compound of claim 10, wherein R^1 is -C(O)-lower alkyl, lower alkyl-$C(O)NR^3R^4$ (either R^3 or R^4 is hydrogen) or lower alkyl-$C(O)NR^3R^4$ wherein R^3 and R^4 bind with an adjacent nitrogen atom to form a saturated nitrogen-containing hetero ring (the hetero ring may be substituted with lower alkyl, halogen, lower alkoxy, phenoxy or benzyloxy).

13. The compound of claim 10, which is selected from

(RS)-1-[1-(acenaphthen-1-yl)piperidin-4-yl]-1,3-dihydro-2H-benzoimidazol-2-one,

(R)-1-[1-(acenaphthen-1-yl)piperidin-4-yl]-1,3-dihydro-2H-benzoimidazol-2-one,

(S)-1-[1-(acenaphthen-1-yl)piperidin-4-yl]-1,3-dihydro-2H-benzoimidazol-2-one,

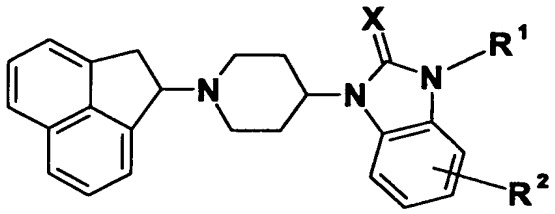
(R)-3-acetyl-1-[1-(acenaphthen-1-yl)piperidin-4-yl]-1,3-dihydro-2H-benzoimidazol-2-one,

(R)-2-{3-[1-(acenaphthen-1-yl)piperidin-4-yl]-2,3-dihydro-2-oxo-benzoimidazol-1-yl}-N-methylacetamide, and

(R)-1-[1-(acenaphthen-1-yl)piperidin-4-yl]-3-(2-oxo-2-piperazin-

1-ylethyl)-1,3-dihydro-2H-benzoimidazol-2-one.

14. The preventive and/or therapeutic agent of claim 1 or 2, wherein the ORL-1 receptor agonist is a compound represented by the formula (I)



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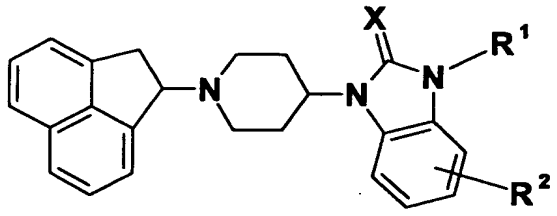
wherein each symbol is as defined above, a racemic mixture thereof, an enantiomer corresponding thereto, or a pharmaceutically acceptable salt thereof.

15. A method of preventing and/or treating a sleep disorder, comprising administering an effective amount of an ORL-1 receptor agonist to the patients.

16. The method of claim 15, wherein the ORL-1 receptor agonist has an affinity of 1000 nmol/L or less IC_{50} value for ORL-1 receptor, and further inhibits cAMP elevation caused by a cAMP inducer by 50% or more at a concentration of 1000 nmol/L or less.

17. The method of claim 15, wherein the ORL-1 receptor agonist is a compound represented by the formula (I)



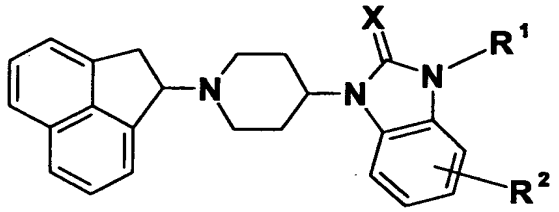
(I)

wherein each symbol is as defined above, a racemic mixture thereof, an enantiomer corresponding thereto, or a pharmaceutically acceptable salt thereof.

18. Use of an ORL-1 receptor agonist for manufacturing a preventive and/or therapeutic agent for a sleep disorder.

19. The use of claim 18, wherein ORL-1 receptor agonist has an affinity of 1000 nmol/L or less IC_{50} value for ORL-1 receptor, and further inhibits cAMP elevation caused by a cAMP inducer by 50% or more at a concentration of 1000 nmol/L or less.

20. The use of claim 18, wherein ORL-1 receptor agonist is a compound represented by the formula (I)



(I)

wherein each symbol is as defined above, a racemic mixture thereof, an enantiomer corresponding thereto, or a pharmaceutically acceptable salt thereof.